

# MitoAge: a database for comparative analysis of mitochondrial DNA, with a special focus on animal longevity

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<http://www.mitoage.info/>

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and Vadim E. Fraifeld<sup>1,\*</sup>

# What is MitoAge?

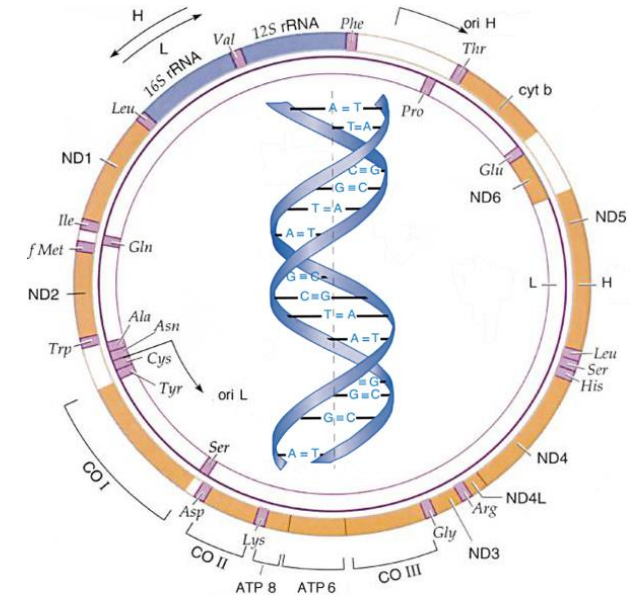
MitoAge is a curated, publicly available database, containing an extensive collection of calculated mtDNA data, integrated with longevity records. The MitoAge website also provides the basic tools for comparative analysis of mtDNA, with a special focus on animal longevity.

## Why is it important?

Mitochondria are the most “hard-working” organelles and the only organelles in the animal cell that have their own genome. They have long been considered one of the major players in the mechanisms of aging, longevity and age-related diseases. We and others have shown strong correlative links between mammalian maximum lifespan and mtDNA base composition.

## What data is available?

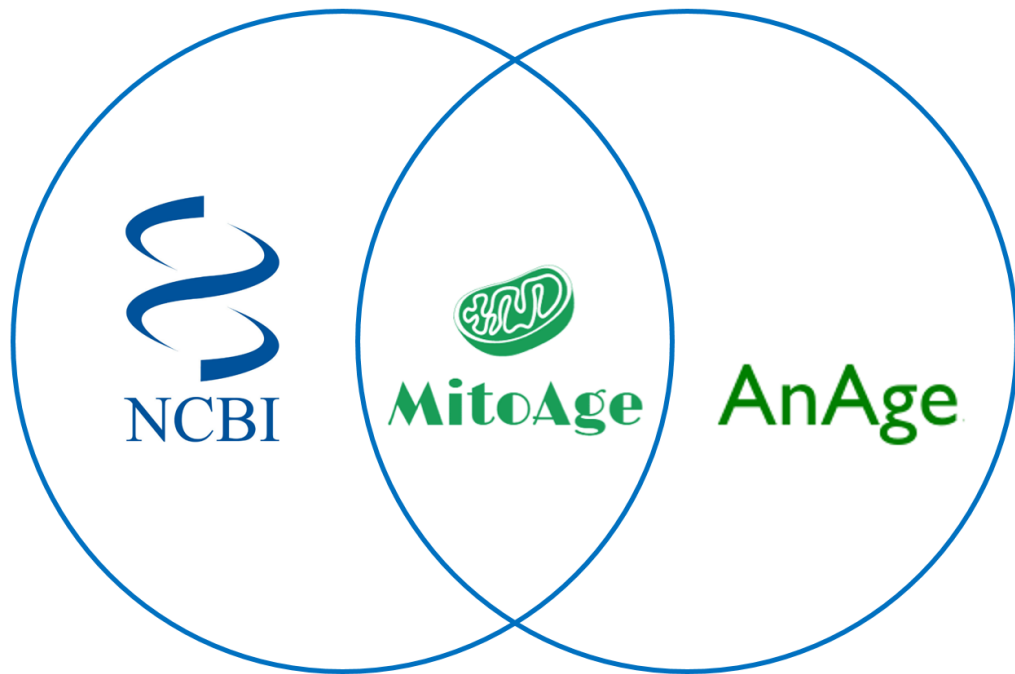
MitoAge contains calculated mtDNA compositional features of the entire mitochondrial genome, mtDNA coding (tRNA, rRNA, protein-coding genes) and non-coding (D-loop, insertions) regions, codon usage for each protein-coding gene, amino acids frequency, and longevity records for over 900 species from the Kingdom Animalia.



“The reasons for some animals being long-lived and others short-lived, and, in a word, causes of the length and brevity of life call for investigation.”



Aristotle (350 B.C.): *On Longevity and Shortness of Life*



- Fast, simple and intuitive design
- Easily updated
- Manually and automatically curated
- Export tool
- On-the-fly calculations
- Statistics
- Comparison tools

Taxa (scientific name)	Species
Mammals (Mammalia)	390
Birds (Aves)	152
Reptiles (Reptilia)	94
Amphibians (Amphibia)	29
Fishes (Actinopterygii, Sarcopterygii, Cephalaspidomorphi, Chondrichthyes)	251
Non-chordates (Bivalvia, Echinoidea, Chromadorea, Insecta, Malacostraca)	6
<b>Total</b>	<b>922</b>

**1** Switch between Taxonomy, Genes and Stats browsing

**2** Quick access to families or species in the group

**3** Compare your datasets of interest by adding and removing them using the Compare Basket

**4** Export tool allows to save a specific sections in a CSV format

**5** Help menu provides all necessary assistance

**5** See general info; download the entire database or its parts

Browse stats: All species / Mammalia / Primates

**Browsing families:**

- Callitrichidae (6)
- Cebidae (9)
- Cercopithecidae (32)
- Cheirogaleidae (1)
- Daubentoniidae (1)
- Galagonidae (3)
- Hominidae (5)
- Hylobatidae (3)
- Indridae (1)
- Lemuridae (7)
- Loridae (3)
- Pitheciidae (4)
- Tarsiidae (2)

**Species in group (77):**

- Allenopithecus nigroviridis
- Alouatta caraya
- Aotus azarai
- Aotus lemurinus
- Ateles belzebuth
- Cacajao calvus
- Callicebus cupreus

	GC (%)	AT (%)	G (bases)	C (bases)	A (bases)	T (bases)	Maximum lifespan (yrs)
Stats for total	37.5 - 45.7%	54.3 - 62.5%	4003 - 5...	1981 - 2310	3897 - 5046	5007 - 5733	
Range (min-max)	37.5 - 45.7%	54.3 - 62.5%	4003 - 5...	1981 - 2310	3897 - 5046	5007 - 5733	
Median	40.6%	59.4%	4526	2145	4475	5336	30.3
Average ± stdev	40.9 ± 2.2%	59.1 ± 2.2%	4644 ± 338	± 65	4475 ± 304	5350 ± 156	32.9 ± 14.3
Coefficient of variation	0.05	0.04	0.07			0.03	0.43
Pearson correlation coefficient with log <sub>10</sub> MLS	0.51	-0.51	0.50			-0.50	

**Stats for total protein-coding genes (group size: 77 species)**

	GC (%)	AT (%)	G (bases)	C (bases)	A (bases)	T (bases)	Maximum lifespan (yrs)
Range (min-max)	37.1 - 46.3%	53.7 - 62.9%	2902 - 3930	1211 - 1447	2745 - 3501	3316 - 3769	16.0 - 122.5

**MitoAge**

Home Browse Compare stats (2) Start typing and press enter Help Info & download

### Viewing data for *Arctica islandica*

Browse: All taxonomic classes / Bivalvia / Veneroida / Arctiidae / Arctica islandica

General info Base composition - general Protein-coding genes - base composition Codon usage

Scientific name: *Arctica islandica*  
 Common name: Ocean quahog clam  
 Maximum lifespan: 507.00 years (*Arctica islandica*@AnAge)

**1** General info

**2** Protein-coding genes - base composition

**3** ATP6 (size: 744 bases)

Amino acid sequence: MMSDLFSPDYISWGGGGYILGFSVIVFSTLLPFFLVGVIVVIVFQFSRVESFFMVMVEGFMNVLETQVMFSGSAHVIFSLFFLLCMNL View full

Amino acid frequencies:

Glutamine (Gln, Q)	Alanine (Ala, A)	Serine (Ser, S)	Threonine (Thr, T)	Cysteine (Cys, C)	Valine (Val, V)	Leucine (Leu, L)
n = 17 (2.88%)	n = 11 (1.84%)	n = 28 (4.54%)	n = 8 (0.84%)	n = 1 (0.21%)	n = 28 (4.54%)	n = 31 (5.54%)
Isoleucine (Ile, I)	Methionine (Met, M)	Proline (Pro, P)	Phenylalanine (Phe, F)	Tyrosine (Tyr, Y)	Tryptophan (Trp, W)	Aspartic acid (Asp, D)
n = 14 (2.87%)	n = 18 (2.29%)	n = 8 (2.02%)	n = 28 (4.17%)	n = 8 (2.24%)	n = 8 (2.84%)	n = 9 (2.21%)
Glutamic acid (Glu, E)	Asparagine (Asn, N)	Glutamic acid (Glu, E)	Histidine (His, H)	Lysine (Lys, K)	Arginine (Arg, R)	
n = 17 (2.88%)	n = 8 (2.02%)	n = 8 (2.02%)	n = 8 (2.02%)	n = 8 (2.02%)	n = 8 (2.02%)	

Codon statistics:

AUU	AUC	AUA	CUU	CUC	CUA	CUG	UUA	CAA	CAG	GUU	GUC	GUA	GUG	UUU	UUC
14	0	12	7	1	1	0	17	3	1	6	0	11	9	30	5
AUG	UGU	UGC	GCU	GCC	GCA	GCG	GGU	GDC	GGA	GGG	CCU	CCC	CCA	CCG	ACU
8	2	1	8	1	3	1	6	2	5	4	3	1	0	1	8
ACC	ACA	ACG	UCU	UCC	UCA	UCG	AGU	AGC	UAU	UAC	UGG	UUG	AAU	AAC	CAU
0	2	1	7	0	4	1	4	0	7	1	0	5	4	1	5
CAC	GAA	GAG	GAU	GAC	AAA	AAG	CGU	CGC	CGA	CGG	AGA	AGG	UAA	UAG	UGA
0	4	3	3	0	4	1	0	0	2	2	6	6	1	0	3

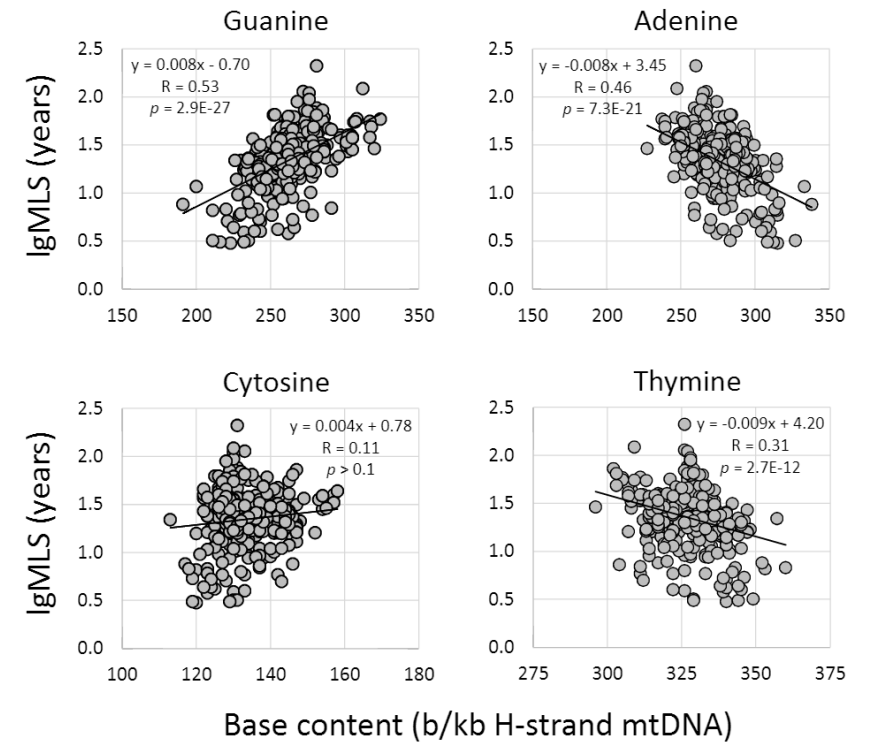
Codons with 1st base G: 64  
 Codons with 2nd base G: 49  
 Codons with 3rd base G: 47

Codons with 1st base C: 27  
 Codons with 2nd base C: 37  
 Codons with 3rd base C: 13

Codons with 1st base A: 57  
 Codons with 2nd base A: 38  
 Codons with 3rd base A: 78

Codons with 1st base U: 90  
 Codons with 2nd base U: 124  
 Codons with 3rd base U: 110

Mammals: Correlations of MLS with mtDNA base content (n = 390)



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